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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/818,324	03/26/2001	Nancy E. Iwamoto	30-5009 (4960)	1114

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EXAMINER
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MAYES, MELVIN C

ART UNIT	PAPER NUMBER
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1734

DATE MAILED: 03/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/818,324	<b>Applicant(s)</b> IWAMOTO ET AL.	
	<b>Examiner</b> Melvin Curtis Mayes	<b>Art Unit</b> 1734	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 December 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 13-15 and 22-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13-15 and 22-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

(1)

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

(2)

Claims 13-15 and 22-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chung 6,399,178 in view of Calhoun et al. 5,275,856 and Wasulko 5,049,434.

Chung discloses a method for bonding an electronic device to an electronic substrate comprising: providing a B-staged underfill preform; tacking the underfill preform to the electronic substrate; laminating the device to the electronic substrate via the underfill preform; and heating to cure the underfill preform. The underfill preform comprises a thermoplastic-based or thermosetting-based polymer adhesive which is strong and flexible when dried or B-staged to facilitate handling and laminating to a device or substrate but is rigid after curing. The adhesive is loaded with filler such as alumina to reduce the coefficient of thermal expansion and to enhance thermal conductivity. Chung discloses that the adhesive underfill preform can be made to include conductive solder bumps in the same pattern, pitch and position as that of the contact pads of the substrate to which the underfill preform will interconnect by providing the underfill preform with a pattern of holes which are filled with columns of solder paste or solder cream (col. 7 – col. 23, specifically col. 14 – col. 16). Chung discloses forming the underfill preform on a Teflon release liner (Example 4) and discloses forming the holes in the adhesive for the solder paste by die cutting or photo-etching (col. 23, lines 16-34) but does not disclose applying the

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perform to the electronic substrate before peeling the release liner from the perform or forming the holes by lasing or drilling.

Calhoun et al. teach that in making an adhesive web for interconnecting two electrical devices via conductive material in areas corresponding to the electrodes to be interconnected, the adhesive is provided as part of a tape comprising a flexible carrier web that has a low adhesion face, such as papers having polymeric coatings, onto which the adhesive layer is provided. The adhesive layer is separated from the carrier web to bond the two electrical devices. Calhoun et al. further teach that the perforations in the adhesive for the conductive material can be formed by punching or laser drilling and teach that the adhesive web can include not only fillers but also other useful materials such as woven and nonwoven fabrics (col. 2, lines 10-68, col. 5, lines 31-37 and 54-59).

Wasulko teaches that adhesive for attachment of electrical devices to a device substrate is provided as an adhesive transfer system having a carrier film which releasably holds the adhesive. In use, the carrier film is superimposed over the device substrate for transfer of the adhesive and stripped from the adhesive when it is desired to assemble the device on the adhesive. Wasulko teaches that representative support (carrier) films include paper and thermoplastic polymers coated with a suitable release layer such as silicone and fluorocarbon compositions. Wasulko teaches that when the adhesive is transferred to the substrate, the support film functions as a protective release film over the adhesive until stripped for bonding of the device to the substrate (col. 2, lines 35-68, col. 4, lines 1-29, col. 5, lines 23-35).

It would have been obvious to one of ordinary skill in the art to have modified the method of Chung for bonding an electronic device to an electronic substrate by providing the

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B-staged underfill preform on a release liner carrier web for transfer to the substrate for bonding an electronic device such as an IC, as Calhoun et al. teach that an adhesive web for interconnecting two electrical devices is provided as part of a tape comprising a flexible carrier web that has a low adhesion face onto which the adhesive layer is provided and as Wasulko teaches that adhesive for attachment of electrical devices to a device substrate is provided as an adhesive transfer system having a carrier film which releasably holds the adhesive and that is not stripped from the adhesive until it is desired to assemble a device on the transferred adhesive. Providing the underfill preform on a releasable carrier film would have been obvious to one of ordinary skill in the art to provide the adhesive preform with a carrier film which functions as a protective release film over the adhesive until it is desired to assemble the device on the adhesive on the substrate, as taught by Wasulko.

Providing the carrier web as a film coated with a release agent such as silicon or a fluorocarbon such as Teflon<sup>7</sup>, as claimed in Claims 14 and 22, would have been obvious to one of ordinary skill in the art, as taught by Wasulko, as representative carrier films that can be used to transfer adhesive for attachment of an electrical device to a substrate.

Providing the holes in the underfill preform to be filled with the solder paste by lasing, as claimed in Claim 15, would have been obvious to one of ordinary skill in the art, as Calhoun et al. teach that the perforations in the adhesive for the conductive material can be formed by punching or laser drilling.

Providing the underfill preform with a fine mesh fiber that is thermally conductive and electrically non-conductive, as claimed in Claims 23 and 24, would have been obvious to one of ordinary skill in the art, as Calhoun et al. teach that the adhesive web can include not only fillers

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but also other useful materials such as woven and nonwoven fabrics. Providing a fabric that is thermally conductive and electrically non-conductive in addition to filler such as alumina to reduce the coefficient of thermal expansion and to enhance thermal conductivity would have been obvious to one of ordinary skill in the art to further enhance the thermal conductivity or reinforce the adhesive underfill preform.

***Response to Arguments***

(3)

Applicant's arguments filed December 11, 2003 have been fully considered but they are not persuasive.

Applicant argues that the claimed invention claims a pre-form assembly comprising a base layer of thermosetting or thermoplastic material and wire or solder paste through conductors while the embodiments of Chung comprise a rigid adhesive underfill which does not comprise through conductor before mating with the supporting surface but only has through conductors after mating with the surface. Applicant argues that Calhoun et al. does not contemplate using solder paste.

(4)

Chung 6,399,178 not only discloses embodiments where the underfill is provided with through conductors by laminating to a substrate but also discloses that the underfill can be provided with through conductors before laminating to the substrate. According to Chung, the adhesive underfill preform can be made to include conductive solder bumps in the same pattern, pitch and position as that of the contact pads of the substrate to which the underfill preform will

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interconnect by first providing the underfill preform with a pattern of holes which are filled with columns of solder paste or solder cream. This preform of B-staged adhesive and having columns filled with solder paste is then laminated to the substrate (col. 14, lines 16-50). Thus Chung clearly discloses providing a pre-form assembly having a base layer of thermosetting material and solder paste through conductors and which is to be applied to a substrate, as claimed.

Chung further discloses forming the underfill preform on a Teflon release liner, which corresponds to the claimed sacrificial layer. Calhoun et al. is pertinent because the reference teaches that an adhesive web for interconnecting two electrical devices is provided as part of a tape comprising a flexible carrier web that has a low adhesion face onto which the adhesive layer is provided, teach that perforations in the adhesive for the conductive material can be formed by punching or laser drilling and teach that the adhesive web can include not only fillers but also other useful materials such as woven and nonwoven fabrics. The particular conductive mixture used by Calhoun et al. is not relevant since it is Chung that clearly discloses using solder paste as the through conductor material in an adhesive underfill preform.

### ***Conclusion***

(5)

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

(6)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melvin Curtis Mayes whose telephone number is 571-272-1234. The examiner can normally be reached on Mon-Fri 7:30 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on 571-272-1226. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Melvin Curtis Mayes  
Primary Examiner  
Art Unit 1734

MCM  
February 20, 2004